

Deterrence and transmission as mechanisms ensuring reliability of gossip

Francesca Giardini

Received: 16 December 2010 / Accepted: 19 September 2011
© Marta Olivetti Belardinelli and Springer-Verlag 2011

Abstract Spreading information about the members of one's group is one of the most universal human behaviors. Thanks to gossip, individuals can acquire the information about their peers without sustaining the burden of costly interactions with cheaters, but they can also create and revise social bonds. Gossip has also several positive functions at the group level, promoting cohesion and norm compliance. However, gossip can be unreliable, and can be used to damage others' reputation or to circulate false information, thus becoming detrimental to people involved and useless for the group. In this work, we propose a theoretical model in which reliability of gossip depends on the joint functioning of two distinct mechanisms. Thanks to the first, i.e., deterrence, individuals tend to avoid informational cheating because they fear punishment and the disruption of social bonds. On the other hand, transmission provides humans with the opportunity of reducing the consequences of cheating through a manipulation of the source of gossip.

Keywords Gossip · Reputation · Cooperation · Evolution

Introduction

In social groups, humans exchange information about other individuals, their actions, behaviors, and attitudes, even if

they have never met each other before. Receiving information about an absent third party is one of the most effective ways of gathering news about our peers and transmitting it is what is usually termed “gossip.” It is also a widespread phenomenon in human societies, well-documented in many different kinds of societies and traditions. Since the appearance of Gluckman's article in 1963 in which it was defined as a “culturally controlled game with important social functions” (p. 312), several researchers endeavored to show the positive aspects of gossiping, both at the individual and at the social level (just to mention some contributions: Barkow 1992; Baumeister et al. 2004; Dunbar 1996; Ellickson 1991; Gintis et al. 2001; Goodman and Ben-Ze'Ev 1994; Hess and Hagen 2009; Noon and Delbridge 1993; Wert and Salovey 2004).

Of course the gossip can be just “idle-talk” or a pleasurable activity people engage in for their own personal amusement, but in most cases is not just that. Gossiping can be regarded as a socially complex behavior through which:

1. social information, i.e., information about an absent third party, is gathered;
2. competence and reliability of informers is tested;
3. one's own belonging to a group or sub-group is made salient.

Gossipers select among the information they have the one they want to transmit, but they also choose a receiver and even a way to transmit that information. Gossiping allows both to create and maintain bonds and to acquire useful information without bearing the costs of direct experience.

Gossiping can be used also for strategic purposes, as a means to deceive people into thinking that, for instance, a potential partner has a better (or worse) reputation. This led

This article is a part of the Supplement Issue on “Social Agents. From Theory to Applications”, guest-edited by Isabella Poggi, Francesca D'Errico, and Alessandro Vinciarelli.

F. Giardini (✉)
Department of Cognitive Science, Central European University
(CEU), 1023 Frankel Leo u., 30-34, Budapest, Hungary
e-mail: francesca.giardini@istc.cnr.it

several scholars to raise the problem of reliability as one of the defining features of gossip (Barkow 1992; Hess and Hagen 2006; Paine 1967), and it poses some challenging questions: if communication can be used to lie, how did it survive? Why did false gossip not rule out honest communication if cheating is more profitable? Even if these questions apply to every kind of communication, including animal one (Zahavi and Zahavi 1997; Maynard Smith and Harper 1995; Maynard Smith and Harper 2003), here reliability is especially important because gossip is a powerful means of partner selection and social control (Dunbar 1996; Giardini and Conte 2011).

In this work, we claim that the reliability of gossip rests on two pillars: deterrence and transmission. In a nutshell, deterrence prevents deterioration of gossip and its becoming totally unreliable, while transmission ensures protection in those cases in which information is uncertain or it is purposefully false. When spreading false social information, the gossiper can be punished not only by the receiver, but also by the gossiped. This means that spreading false news about someone can be twice as dangerous as spreading false or uncertain information about an inanimate object, like for instance the quality of a movie or the location of a resource. Fear of punishment should have ruled out gossip, leading people to restrain from talking about others, at least when the information is uncertain, inaccurate, or false. This leads us to raise a different set of questions: how did gossip gain the importance it has and what prevented it from extinction or transformation into something different? Why did it not change into some kind of very restricted form of communication, but is it still widespread and present in human societies all over the world?

We try to answer these questions by considering two mechanisms that, taken together, can account for the evolutionary stability of gossip. Deterrence is a general mechanism that applies to other forms of communication and to other species (Scott-Phillips 2008). In the case of gossip, deterrence implies that the untrustworthy gossiper can be punished by both the receiver and the gossiped and third-party punishment enabled by language makes this possibility more striking and more likely to occur. The extreme consequence can be social exclusion, an extremely unfavorable outcome, which is totally in contrast with the affiliative needs satisfied through gossiping. Differently than deterrence, the mechanism of transmission¹ is specific to gossip and reputation. Building upon the cognitive model of reputation put forward by Conte and Paolucci (2002), we argue that language provided humans with the possibility of performing complex manipulations on

the information transmitted, allowing them to avoid responsibility for what is told and then to escape punishment. Transmission is one of the most frequently underrated aspects of gossip, with most of the accounts focusing on the content or on the relationship between the individuals involved and failing to address the fact that when reporting information about someone else people may lie about the source, preventing others to recognize them as the actual origin of gossip.

Because of language humans can hide behind expressions like “I have been told that...”, or “people say...” so spreading false information about someone without carrying the burden of being regarded as unreliable informers. This allows gossipers to be protected against retaliation and to maintain their bonds even when transmitting false or unverified information. The threat of social exclusion and the possibility of escaping responsibility for false or inaccurate evaluations, along with the need for social bonds, led to the survival of gossiping.

The rest of the paper is organized as follows: “[Perspectives on gossip](#)” reviews some conceptions of gossip and reputation, showing on the fact that transmission is almost absent from most of them. “[A cognitive model of gossip](#)” introduces a cognitive model of gossip, in which the importance of the source is clearly underlined and an important distinction between information with known and unknown source is introduced. “[Deterrence and transmission as the evolutionary pillars of gossip](#)” describes the principles of deterrence and transmission, discussing their role for the stability of gossip. Finally, in “[Conclusions](#)” some conclusions are drawn.

Perspectives on gossip

Defining gossip is far from being an easy task. Dictionary definitions concentrate on its being “casual” or “unreliable,” features always present in the everyday usage of word “gossip.” These negative features are prominent also in some scholarly accounts (Taylor 1994), in which it is reduced to idle- or malicious talk behind someone’s back. Here we will use the definition provided by Noon and Delbridge (1993), who define gossip as “the process of informally communicating value-laden information about the members of a social setting” (p. 25). This definition highlights the dynamic aspect of gossip and the fact that it permits to spread valuable information about one’s peers. One of the first contributions about the social relevance of gossip has been the Gluckman’s article in 1963, in which the positive functions of gossip at group level were highlighted. Gluckman (1963) has been one of the pioneers in the study of gossip and one of the first to stress its positive virtues, among which its ability to maintain the unity, morals and values of social groups. Gossipers share and

¹ Transmission is specific as long as we accept that “reputation” is an evaluation in which the source is hidden.

transmit relevant social information about group members within the group, at the same time isolating out-group individuals. Besides, reputation contributes to stratification and social control, since it works as a tool for sanctioning deviant behaviors and for promoting, even through learning, those actions that are functional with respect to the group's goals and objectives.

An opposite interpretation about gossip has been firstly suggested by Paine (1967) who, in contrast with the Gluckman's account, considered gossiping as a self-serving behavior, aimed mainly at attacking others and promoting one's own status within the group. Similarly, the Haviland (1977) study on the Zinacantecan patterns of gossip points out to the usage of gossip as a means to promote one's own advantage to the detriment of others, especially when the group is subject to internal struggles. The opposition between "self-serving" and "group-serving" accounts of gossip has characterized the field for long time, leading scholars to look for elements supporting one or the other view. These views are not incompatible if we consider that gossip intentionally spread for self-serving purposes can have a positive effect at the group level.

Boehm (1984) calls gossip a kind of "court-room" and concludes that it works as a system through which what should be morally acceptable or unacceptable within the group is continuously reassessed and refreshed. Other anthropologists (Stewart and Strathern 2004) suggest an interesting linkage between gossip and witchcraft, reporting studies about the critical role of rumor and gossip in community contexts that lead to accusations of witchcraft: "It is a part of our overall argument that even when particular notions of witchcraft or sorcery are not involved, rumor and gossip themselves may act as a kind of witchcraft, projecting guilt on others in ways that may cause them harm: for example, to lose their jobs, to be physically attacked, or to be socially shamed" (p. 29). Scholars have tended to stress either positive or negative functions of gossip, but there is always the possibility of both positive and negative results, and sometimes these may be mutually implicated: a positive result for some people may be negative for others (Stewart and Strathern 2004).

Turning our attention to the motivations to gossip, we find that some authors define gossip as idle-talk, giving a preeminence to its relaxing and undemanding aspects (Ben-Ze'ev 1994; De Sousa 1994), whereas others contend that gossip has social purpose and people do not engage in it simply for entertainment, but mainly to achieve their goals (Foster 2004; Fine and Rosnow 1978). Fine and Rosnow (1978) draw attention to three main social functions served by gossip: information, influence, and entertainment. Gossip is a valuable source of information about the community, its members, its norms, values and habits, but it is also useful to map the social environment and to

make inoffensive comparisons. Regarding the influence, this function is potentially prevalent when newcomers join the group or when there are conflicts between members. Foster (2004) adds a fourth function: friendship, that refers both to dyadic relationships and to group bonded together by the sharing of norms and values.

Other researchers consider gossiping as a means of knowledge: according to Ben-Ze'ev (1994) gossip is a pleasurable way to gather information that is otherwise hard to obtain, but it also serves to satisfy the so-called *tribal need*, namely, the need to belong to the group and to be accepted by it.

More recently, Baumeister et al. (2004) describe gossip as an exchange of useful information people can rely upon to face new situations and to behave properly when direct experience is impossible or too costly to acquire. Wert and Salovey (2004) highlight the social character of gossip, and define it as an *evaluative talk* aimed at social comparison. Through gossip people can map the social environment and become conscious of their position within it.

The absence of the target is one of the defining features of gossip, but it is also one of the reasons why gossip is condemned as immoral and is considered a malicious and harmful resource towards use to criticize their peers (Taylor 1994). According to this perspective, the absent third party finds herself in an uncomfortable position: she is not aware of what is told about her and she cannot defend against gossip. On the contrary, the absence of the third party can be considered as playing a positive function in protecting the gossiped against direct and embarrassing attacks or comparisons. In light of social comparison theory (Festinger 1954), gossip can be regarded as a necessary tool for healthy social functioning, that allows people to compare their skills and achievements with those of others, without suffering from direct and, somehow, harmful, comparisons (Wert and Salovey 2004). This view seems to reconcile the opposition between self-serving and group-serving gossip we discussed above. Promoting one's own abilities and successes can be functional to let other people know about what characteristics are valuable within a given group (courage, for instance), thus indirectly promoting the display of that behavior in the group. In an evolutionary perspective, the relevance of gossip has been primarily addressed by Dunbar (1996), whose seminal work on grooming and gossip has clearly addressed the correlation between social information and the evolution of larger brains in human and non-human primates (Dunbar 2001).

Reputation, via gossip, has attracted the interest of researchers from evolutionary biology and experimental economics, who are interested in the role that reputational concerns, and gossip transmission could have played in the evolution of cooperation. Theories of indirect reciprocity

show how cooperation in large groups can emerge when agents are endowed with or can build a reputation (Alexander 1987; Mohtashemi and Mui 2003; Nowak 2006; Ohtsuki and Iwasa 2004; Panchanathan and Boyd 2003). From theoretical models and simulations (Nowak and Sigmund 1998a, b) to laboratory experiments (Milinski et al. 2002; Sommerfeld et al. 2007a, b; Wedekind and Milinski 2000), there is a growing body of evidence that human cooperation in large groups can be explained in terms of conditional helping by individuals who want to uphold a reputation and so to be included in future exchanges (Panchanathan and Boyd 2004). Moreover, several studies (Haley and Fessler 2005; Burhnam and Hare 2007; Bateson et al. 2006) point out the existence of cognitive mechanisms or neural substrates especially evolved for taking into account the presence of others and the possibility of being evaluated by them. Reputation can work as a useful guidance to make decisions about possible interactions, to evaluate candidate partners, to understand and predict their behaviors, and to show one's acceptance of the group's values.

Finally, the content of gossip, i.e., personal information about an absent third party, is quite uncontroversial, whereas the nature of the information, either evaluative or factual, is a matter of debate. Some authors require only the repetition of news about an absent third party to define a conversation as gossip, whereas other scholars consider necessary the presence of evaluative remarks to have a gossip talk (Fine and Rosnow 1978). Observational data support the view that gossipers mainly exchange evaluative contents about their peers (Ellickson 1991; Kniffin and Wilson 2005), whereas laboratory experiments show that the mere report of an individual's past action is enough to affect participants' cooperative attitude (Piazza and Bering 2008; Sommerfeld et al. 2007a, b).

Providing a detailed review about the research on gossip is out of the scope of this work, and this overview was meant to point out how scattered is the picture coming from research on this topic. This might be partially due to the inherent difficulty of studying a phenomenon that can be neither reduced to measurable variables nor easily observed "in the wild." In fact, gossiping requires intimacy and discretion, and these two features are hardly compatible with the presence of an external observer (as it happens in observational studies), and are even more difficult to be created within an experimental laboratory.

A cognitive model of gossip

As the above review shows, all those accounts fail to consider the transmission process, which should be one of the main features of gossip and the source of its power.

Language allows gossip to be easily transmitted, but also transformed, an occurrence very likely to happen either accidentally (rumor) or intentionally. Language enables humans to modify the content of what they have been told in a variety of ways, whereas animals can use false signals (fake alarm calls) but they can neither report on a signal from another individual nor report on it as if it came from member of the group. This difference between a signal transmitted as if it has been received by someone else (as in the sentence "someone told me that John is a good guy") and a signal from one's own ("I met John and he is really nice") could have played a key role in the evolution of gossip.

The first ones to formulate this hypothesis were Conte and Paolucci (2002), who developed a model of gossip as an occurrence of the so-called *micro-macro link* (Conte and Castelfranchi 1995): it is an apparently autonomous social behavior whose bases stand in the individuals' minds and in the relationships people engage in. Once created and transmitted gossip influences other agents' minds, changing their beliefs and goals.

In order to provide a characterization of gossip as a process through which social evaluations are transmitted, Conte and Paolucci (2002) focus their attention on the way in which the evaluation is spread. Depending on the presence of the source in the evaluation, two different representations can be accounted for, both in the sender's and in the receiver's mind. When the source of the evaluation is explicitly stated, this implies an assumption about the truth-value of that information, and the evaluation is termed "image." Therefore, *image* is defined as a social evaluation—regarding another agent's competence, behavior, attitudes, etc.—that is assumed to be true by the individual who transmits it. If I say that I saw John kissing another woman, I am also saying that I believe in what I saw, so I believe true the fact that John is a betrayer. Reporting this information to John's wife means to bear the responsibility for what I am telling her. An agent may also report the image that someone else formed about a given target, so I can tell John's wife that Sally saw him kissing another woman. In this case, I do not necessarily assume it to be true, but there is another specific individual who did it and who is in charge of that evaluation.

The term *reputation* defines an evaluation that is not necessarily assumed to be true because the source is missing. In a sense, reputation is a collectively held meta-evaluation because there are agents believing that some others, preferably in their group, believe that an agent is told to have some features. When reporting that I heard that John is a betrayer, I am not, implicitly or explicitly, saying that I have reasons to believe that this evaluation is true. Therefore, I am responsible neither for the evaluation itself nor for its truth-value. Saying that someone believes John

to be a betrayer means to state that this belief is circulating in the group, but it is impossible to assess how many people know it and believe it. Reputation is an objective social property that emerges from a propagating cognitive representation. This lack of an identified source, i.e., its impersonality, is the distinctive feature of reputation, whereas image always requires identifying the individual who made the evaluation (Giardini Conte Paolucci forthcoming).

Generally speaking, gossip has a triadic structure in which we can distinguish:

- A *gossiper*: an agent who has the goal to spread information. Informing another agent can be the gossiper's only purpose, or it can be instrumental to other goals (influencing the receiver, punishing the target, promoting self-image, enhancing groups feelings, isolating someone), more or less hidden.
- A *topic*: an agent whose behaviors, attitudes, choices, and emotions are the topic of the communication. The target belongs to the same group of gossiper and receiver, and she is judged according to the groups' rules and habits.
- A *receiver* (or more than one): one or more agents chosen from the gossiper to be informed about the target. Receivers belong to the same social network, sharing the same knowledge and values of gossiper and gossiped. Choosing the receiver is pivotal to achieve gossiper's goals: the receiver can be the actual target of communication or she can serve as a vehicle to reach the intended target.

When deciding what to tell to whom, the gossiper is aware of the fact that his action may induce new beliefs or goals, partially modifying the mind of the receiver (provided he trusts the gossip and he is interested in it). This mechanism is really powerful: an agent can induce another one to perform an action by making her know that, for instance, the topic has been unfaithful to her. In the above example, if I have the goal of making John split up with his wife, telling her that he kissed another woman is a way to induce a new belief in her mind ("John is a betrayer"), which could lead to the formation of a new goal ("I do not want to be married with a betrayer").² In order to influence another cognitive agent, i.e., an agent endowed with cognitive representations of goals and the capacity to achieve them (Conte and Castelfranchi 1995), the influencer needs to hold a representation of the mind of the influenced. In other terms, deciding what to tell to whom entails epistemic (beliefs and meta-beliefs) and motivational states (goals), but it also requires the capacity to represent how

the initial states would be modified as a consequence of the information received.

Deciding what to tell to whom implies also to decide how to tell, i.e., how the content will be transmitted. In the framework proposed by Conte and Paolucci, transmission is an important aspect and the difference between image and reputation plays a crucial role because it makes possible to distinguish two ways of reporting on the same information, depending on the intentions of the source. The difference between reputation and image in promoting social control at the aggregate level has been tested in a variety of contexts using agent-based simulations (Sabater et al. 2006; Conte et al. 2008; Giardini et al. 2008; Di Tosto et al. 2010). In these studies, population of interacting agents can evaluate their peers and transmit either image or reputation in computer-generated environments, with different degrees of complexity. Results show that for different percentages of cheaters in the population, the spreading of reputation led to better results in terms of agents' payoffs because it prevented the diffusion of retaliatory actions. On the contrary, when agents exchanged image, false informers were retaliated with false information and after few simulation periods communication and cooperation collapsed.

Focusing on the way in which an evaluation is transmitted is important because it shifts the focus from the receiver to the sender. The gossiper does not only select what to tell to whom, but he also selects the way in which this information may be passed on, deciding whether to hide or not the source.

Deterrence and transmission as the evolutionary pillars of gossip

Humans can acquire knowledge about their peers and their environment using three different ways: through direct experience, through observation, and through cultural information (Frith and Frith 2006). If we narrow the definition of cultural information, focusing on a special kind of content, i.e., *social evaluations*, we see how essential they are in order to get valuable knowledge about potential partners and to make predictions about their behaviors. An evaluation is social when an agent is considered as a means to achieve the evaluator's goals in terms of some standards or norms (Miceli and Castelfranchi 2000). If I say that "John is a good teacher" this means to assess John's competences with regard to my goal of receiving/providing high standard education. If I tell Sally that John is a good teacher, I assume that she is sharing my goal of receiving high standard education, as a pupil, or of providing it, and I also assume that this information may be valuable to her. As stated by Emler (2001): "If we are to predict the behavior of

² I acknowledge that belief revision is more complex than it is stated in the example.

our social environment, we need to know things about its particular inhabitants and not just about people in general or in the abstract. Specifically, we need to know what they are like—their personalities, character, abilities—and what their relations are with one another” (p. 332).

Pivotal to the ability of predicting others’ behaviors is the capacity of evaluating their actions, attributing them either a positive or a negative valence. The ability of discriminating between cooperators and cheaters and the capacity of detecting malevolent informers and false communication are crucial cognitive mechanisms for gossip and they seem to appear early in ontogeny. Hamlin et al. (2007) showed that preverbal infants (6-, 9-, 10-, and 12 months old) display social preferences that are influenced by others’ behaviors toward unrelated third parties, both in a choice paradigm and in a violation of expectation paradigm: when looking at social interactions, infants preferred helpers and were independently inclined to avoid hinderers. The authors suggest that this early capacity for evaluations can be a biological adaptation evolved to allow humans to distinguish between cooperators and cheaters and then to engage in cooperative behaviors with reliable partners. Analogously, Mascaro and Sperber (2009) investigated vigilance toward deception in 3- to 5-year-old children. Their results show that children’s ability to detect epistemic and intentional components of lying and to discriminate between a benevolent and a malevolent informer emerges early and implies developmentally distinct components of epistemic vigilance.

Being able to distinguish between honest and dishonest informers becomes critical in large groups in which direct experience is not feasible, information is asymmetrically distributed and time to acquire it is a limited resource. In everyday life, it is not always possible to create one’s own evaluations and reported evaluations become crucial to decide whether to interact with someone or how to choose among potential partners. This engenders problems of honesty (information manipulation) and accuracy (erroneous rumors) that are inherent in human communication and not specifically raised by gossiping (Nettle 2006).

According to Emler (2001), gossip provides solutions to the problem of reliability posed by itself “insofar as any individual human observer is not dependent on a single source for social information” (p. 133). Collecting information from multiple sources should allow people to overcome the problem of reliability, allowing them to compare news, refine evaluations, and isolate dishonest informers. However, this does not rule the possibility of multiple sources spreading the same false news, either purposefully or not. There are also situations in which the abundance of information makes a decision even more difficult, and it is actually impossible to discriminate

between competing sources, especially when they seem to possess the same degree of reliability.

Our hypothesis is that the problem of reliability of gossip can be solved, thanks to two distinct mechanisms. Deterrence is a general principle, according to which people fear to be regarded as unreliable because this inevitably leads to the disruption of social bonds. Although deterrence can work in general to prevent people from misbehaving, it is worth noticing that spreading false information about someone exposes the dishonest informer to a double risk of being punished, in case the information is found to be false: both the receiver and the gossiped can punish him. But deterrence alone would have led to a situation in which exchanging information about others was extremely risky and even dangerous for one’s standing in the group. A solution to this is provided by the second mechanism, transmission, through which individuals can pass image as if it was reputation, thus hiding behind an unknown source. In what follows we will try to articulate this hypothesis.

A general principle: deterrence

Regarding deterrence, this mechanism is not uniquely human and works through the threat of social exclusion (Scott-Phillips 2008). Sufficient conditions for this kind of signaling are that signals be verified with relative ease and that costs be incurred when unreliable signals are discovered. In the field of animal communication, an alternative to deterrence principle is costly signaling or the so-called handicap principle (Gintis et al. 2001; Maynard Smith and Harper 2003; Smith 2010; Zahavi and Zahavi 1997), according to which a given signal reliability depends on its costs. In conditions in which producing a fake signal would be extremely costly, individuals able to display it should be regarded as reliable signalers. Costly signaling has been successfully applied to explain the provision of collective goods (Bliege Bird et al. 2001), but its applicability to language is a matter of debate (Zahavi and Zahavi 1997).

It is worth noting that the fact that gossip arises within groups and it is about group members increases the likelihood of discovering false signals and it also amplifies the consequences for the cheater. In fact, third parties can punish the gossipier for false information, either directly (withholding cooperation, for instance), or indirectly (reporting other about the malevolent behavior of the gossipier, thus negatively affecting his reputation). Ayim (1994) claims that gossip is empowering to its participants because it gives them access to knowledge, but for the same reason, it is also quite dangerous: “the more vital the information exchanged through gossip, the more potentially damaging such gossip is both to those who are the

topic of the conversation and to those who do the conversing” (Ayim 1994, p. 99).

Moreover, the fact that gossip implicitly conveys messages about the gossipier increases the threat of being regarded as an unreliable informer. Gossiping implies messages about the signaler, in terms of his social skills (“I want you to know that I possess social skills and that I am able to use them”), and ability to foresee the addressee’s needs (“I want you to know that I share some of your interests, so I hope that you will find meaningful the information I am giving to you”). The combination of these aspects result in a signal about the competence of the gossipier, his being knowledgeable about what is going on in the network but also about those who may need or want a specific information.

Another reason for the efficacy of deterrence is the fact that reporting false information about someone else means that the risk of being caught and the consequent punishment are twice bigger: not only X can discover that the information about Z is false, but Z itself can find out that Y is spreading negative gossip about him. In this scenario, Y becomes an unreliable informer for X and a malicious gossipier for Z, thus loosing at the same time at least two direct links and a number of other connections, who are informed about his untrustworthiness.

Loosing links because of false gossip is the opposite of using it as a means of establishing a relationship, the so called affiliative aspect, which is one of its main functions (Gluckman 1963; Dunbar 1996; Emler 2001). Being regarded as a cheater in informational exchanges leads to the disruption of bonds and to social exclusion, i.e., to the opposite of what gossip evolved for, according to the “social brain hypothesis.” Complex social environments in which our ancestors lived have driven the evolution of large brains, necessary to store and manipulate information about many different individuals living in large groups. This implies to remember not only one’s own relationships with those individuals, but also the different kinds of bonds they have with each other (Dunbar and Schultz 2007). In this framework, the social skills required to create and maintain stable links with our peers are among the driving forces that selected for large brains within the primate order (Humphrey 1976; Byrne and Whiten 1988; Dunbar 1998). In human societies, a selective pressure toward larger groups led to the evolution of language as an adaptation that served the same function served by grooming in bonding genetically unrelated individuals (Dunbar 2001).

Ingram et al. (2009) propose an alternative explanation in which the selective pressure for larger group sizes is paired with indirect reciprocity. Basically, expecting to be punished for false information and knowing that, through language, there are good chances of undergo absent third-party punishment led to the evolution of more complex

cognitive abilities. Their argument goes something like this: language allows individuals to be informed about their peers’ actions, increasing the observability of interactions. In systems of indirect reciprocity, reputation is a powerful signal of the quality of the potential partner, and communication about others’ reputation greatly enlarges the possibilities for cooperation. This has created a selective pressure on humans to evolve specific cognitive mechanisms to represent and manipulate their own reputation in the eyes of other group members. The propositional theory of mind (ToM), i.e., the ability of reasoning about beliefs and desires (Wellman 1990), created the potential for humans to reason about their own reputation, allowing us to decide whether to behave selfishly or unselfishly on the bases of our expectations about other’s behaviors. As Ingram et al. (2009) put it: “Language was not just a cognitive prerequisite for propositional ToM to appear (...). Language was an *adaptive problem* for the individual because it frequently led to absent third-party punishment. This adaptive problem was solved by new adaptations, in the form of highly developed ToM and perspective-taking skills” (p. 224). Following this argument, it seems that using language to transmit information about an absent third party entails more costs than benefits, making people vulnerable to being punished by the receiver, the gossiped and also by third parties, related or not. If this analysis is correct, how could gossip survive? Why individuals spread social information, exposing themselves to the risks of retaliation? How to be sure that the transmission of information will not lead to punishment and disrapture of social bonds? How to account for unverified or uncertain information spreading? In the next session, we will try to answer these questions by introducing the mechanism of transmission.

A specific mechanism: transmission

The threat of social exclusion alone could have led to a situation in which the costs of transmitting social evaluations were higher than its benefits, thus discouraging cooperation at the informational level. This is especially true when considering that, along with intentional misinformation, social information spreading can also be inaccurate, thus coming from errors and misunderstandings. Were informers to be excluded from the group for every false or inaccurate evaluation transmitted, gossip would have become a very risky and potentially dangerous behavior. In this scenario, the only safe alternative is to trust only one’s own direct observation and to restrain from transmitting information, but this implies that cheaters are recognized only after direct and thus costly experience. Data coming from simulations experiments (Giardini et al. 2008) show that in control conditions in which agents

could only use direct experience when selecting their partners, the average payoffs were significantly lower than in the condition in which communication was allowed. In laboratory experiments within the framework of experimental economics, the possibility of recording other players' reputation actually prevents the public resource from being overused (Wedekind and Milinski 2000). In general, the opportunity to build up reputation has been proved to increase cooperation in experimental games (Wedekind and Milinski 2000; Milinski et al. 2002) and in more natural settings (Piazza and Bering 2008). Economic experiments from traditional societies all over the world have provided strong support to the idea that reputational concerns can promote cooperation and altruistic behaviors (Gintis et al. 2001; Henrich et al. 2005). So far, evaluating others seems to be risky but really useful, so how to reduce the risks of being punished without reducing the benefits of receiving and transmitting useful information about others?

A possible solution is suggested by Conte and Paolucci (2002), according to whom reputation transmission has the following properties:

1. The gossip is not committed on evaluation's truth-value;
2. The gossip bears no responsibility about evaluations' credibility and consequences since he pins the blame on some unspecified source.

Transmitting inaccurate reputation leads to less severe consequences than spreading inaccurate image, as the agent who spreads it is not responsible for it. Reputation is anonymous in itself, it circulates in the social network but its origin is unknown. Therefore, whereas the spreading of false image can be easily punished, reputation, even if it is proven to be false, cannot be paid back, because there is not anyone in charge for it. This is mainly due to the fact that it is practically impossible to trace a belief about others' beliefs back to its origins and to those who hold it.

The possibility of hiding the source of the evaluation, transforming an image into a reputation and then avoiding the costs of retaliation, is one of the driving forces behind the evolution of gossip (Giardini and Conte 2011). Language allows humans to manipulate the information in different ways, ranging from reporting false information to modifying the source or other elements. This becomes especially striking when information is about other individuals, their actions and attitudes, and false reports can deeply affect their status in the group, their relationships and several aspects of their lives. Moreover, hiding behind the source allows individuals to safely use gossip in a strategic way: individuals competing for scarce resources may spread false or inaccurate reputation to damage their competitor's reputation and improve their own (Barkow 1992; Hess and Hagen 2006).

When informing absent third parties about other individuals' actions, humans can lie in two ways: they can report a false information as if it was true ("I saw John kissing another woman who was not his wife") or they can report a false information as if they were told by someone else ("Someone told me that John was kissing another woman"). Both information are false and both can be detected and cause the gossip to get punished. Nonetheless, in the latter case, the gossip has not direct responsibility about the information which is reported as coming from an unknown source. This applies not only on the gossip side, but also on the receiver one. In fact, knowing that the evaluation comes from an unknown source makes it less trustworthy and pushes toward the search for further evidence. Hess and Hagen (2006) report results from four experiments about evaluation of veracity of reputation-relevant gossip, showing that multiple sources of gossip increase its perceived veracity. Analogously, Sommerfeld et al. (2007a, b) tested the effects of multiple gossip statements on cooperation levels and found that, even when direct observation was possible, participants were strongly inclined to rely on multiple consistent information received by their peers. The absence of the source could work not only to protect the gossip, but it may also function as a cue for the receiver of the fact that reputational information is not totally reliable and it could be useful to look for further information.

Conclusions

In social groups, individuals exchange information about their peers' actions, behaviors, and attitudes. This exchange of information permits individuals to make more accurate and complete predictions and evaluations about their peers; on the other hand, knowing facts about potential partners is pivotal to the establishment of new social links. Several scholars have pointed out the many positive functions served by gossip, both at the individual and at the group level. However, the transmission of socially relevant information about members of one's own group has also some drawbacks. In this work, we focused on the problem of reliability of gossip, trying to suggest that two distinct mechanisms could have worked in favor of the evolution and maintenance of this behavior.

To this purpose, we first introduced a cognitive model of gossip developed by Conte and Paolucci (2002), in which they call attention to a usually neglected aspect, i.e., transmission. When reporting the information about others, people can lie, either modifying the content of the information or its source. The same piece of information is called "image" when the source is made explicit and "reputation" when the gossip refers to the gossip as

coming from an unknown source. This difference is not inconsequential, since transmitting an evaluation as if coming from an unknown source means to avoid responsibility for the truth-value of that information, allowing the sender to escape punishment.

Being punished for reporting false social information may be not only frequent, but also extremely dangerous because bonds with the receiver and the gossiped can be broken, as well as with people coming to know that the informer is unreliable. This is what we called “deterrence”, a general mechanism that makes informational cheating unprofitable because the costs of being caught are higher than the benefits of cheating, in general. Transmission is the second mechanism, the one that permits to overcome this limitation by manipulating the source of the information. When transmitting an information, people can choose how to do it, and hiding behind a reputational evaluation they can escape the related responsibility.

Using agent-based simulation, the difference between image and reputation has been experimentally tested, and the results show that image triggers a perverse retaliatory mechanism that leads cooperation to collapse. Regarding experiments with human subjects, so far the importance of transmission has been greatly underrated. Sommerfeld et al. (2007a, b) report results in which subjects playing interaction games with real money are given the opportunity of receiving gossip statements. However, these comments are distributed by the experimenter in a centralized way to subjects, without allowing them to choose what to tell to whom, as in true gossiping. The same limitation can be found in observational studies in which it is hard to determine whether the source is the actual source or he is simply spreading reputation. Further experimental evidence is needed to verify to what extent reputation can prevent retaliation and foster the spreading of socially relevant information.

In this work, the role of language has been purposefully not taken into consideration because exploring the relationship between language and gossip would require a whole paper and can be hardly restricted into few pages. However, in line with Smith (2010), we surmise that language encourages new forms of collectively beneficial displays, i.e., social evaluations transmission and reputation management. Language provides humans with the opportunity of exchanging knowledge about their peers and it also allows them to manipulate this kind of information. This is in line with the Dunbar’s argument, according to whom: “Primates can only know about what they see for themselves. Should an ally defect or renege on its coalition partner while the partner is not there, that partner will never know and may thus be exploited with impunity. Language provides us with a medium of information exchange that overcomes this limitation. We can monitor what is going elsewhere within the

network, allowing continuous updating of our knowledge of the matrix of relationships” (Dunbar 2001, p. 191). Not only we can know what happened elsewhere in the group, but we can decide to tell it to other people, even to inform the whole group about other’s actions and choices.

Finding a convenient explanation for the evolutionary stability of gossip is challenging for many reasons. First, it implies to deal with extremely complex issues, like the evolution of language and the phylo-genetic and onto-genetic development of modern humans. Second, evolutionary accounts are often at risk of being “just so stories,” and only accurate testing of the hypotheses can rule out this possibility. Finally, the complexity of gossip itself, with its tangled web of affective, informational and strategic components make it extremely difficult to identify a single trajectory of evolution and a further investigation of alternative evolutionary paths is needed.

Acknowledgments The author would like to thank Rosaria Conte, Mario Paolucci, Gennaro Di Tosto and all the participants at the International workshop on “Foundations of social signals. An outline”, held in Rome in 2009 for useful comments and insights.

References

- Alexander RD (1987) The biology of moral systems hawthorne. Aldine de Gruyter, NY
- Ayim M (1994) Knowledge through the grapevine: gossip as inquiry. In: Goodman RF, Ben-Ze’ev A (eds) Good gossip Lawrence. University Press of Kansas, KS, pp 85–99
- Barkow JH (1992) Beneath new culture is old psychology: Gossip and social stratification. In: Barkow JH, Cosmides L, Tooby J (eds) The adapted mind: evolutionary psychology and the generation of culture. Oxford University Press, New York, pp 627–637
- Bateson M, Nettle D, Roberts G (2006) Cues of being watched enhance cooperation in a real-world setting. *Biol Lett* 2(3):412–414
- Baumeister RF, Zhang L, Vohs KD (2004) Gossip as cultural learning. *Rev Gen Psychol* 8:111–121
- Ben-Ze’ev A (1994) The vindication of gossip. In: Goodman RF, Ben-Ze’ev A (eds) Good gossip Lawrence. University Press of Kansas, KS, pp 11–23
- Bliege Bird RL, Smith EA, Bird DW (2001) The hunting handicap: costly signaling in human foraging strategies. *Behav Ecol Sociobiol* 50:9–19
- Boehm CH (1984) Blood revenge: the anthropology of feuding in Montenegro and other nonliterate societies. University Press of Kansas, Lawrence
- Burnham T, Hare B (2007) Engineering human cooperation: does involuntary neural activation increase public goods contributions? *Hum Nat* 18(2):88–108
- Byrne RW, Whiten A et al (1988) Machiavellian intelligence: social expertise and the evolution of intellect in monkeys, apes, and humans. Oxford University Press, New York
- Conte R, Castelfranchi C (1995) Cognitive and social action. UCL Press, London
- Conte R, Paolucci M (2002) Reputation in artificial societies: social beliefs for social order. Springer, Heidelberg
- Conte R, Paolucci M, Sabater J (2008) Reputation for innovating social network’s. *Adv Comp Syst* 11(2):303–320

- De Sousa R (1994) In praise of gossip: indiscretion as a saintly virtue. In: Goodman RF, Ben-Ze'ev A (eds) *Good gossip* Lawrence. University Press of Kansas, KS, pp 25–33
- Di Tosto G, Giardini F, Conte R (2010) Reputation and economic performance in industrial districts: modelling social complexity through multi-agent systems. In: Takadama K, Cioffi-Revilla C, Deffuant G (eds) *The second world congress on social simulation (WCSS08)*. Heidelberg, Springer-Verlag
- Dunbar R (1996) *Grooming, Gossip and the evolution of language*. Faber & Faber, London
- Dunbar R (1998) The social brain hypothesis. *Evol Anthropol* 6:178–190
- Dunbar R (2001) Brains on two legs: group size and the evolution of social intelligence. In: de Waal F (ed) *Tree of origin*. Harvard University Press, Cambridge, pp 173–192
- Dunbar R, Schultz F (2007) Evolution in the social brain. *Science* 317:1344–1347
- Ellickson RC (1991) *Order without law how neighbors settle disputes*. Harvard University Press, Cambridge
- Emler N (2001) Gossiping. In: Giles H, Robinson WP (eds) *Handbook of language and social psychology*, 2nd edn. Wiley, Chichester, pp 317–338
- Festinger L (1954) A theory of social comparison processes. *Hum Relat* 7:117–140
- Fine G, Rosnow R (1978) Gossip, gossipers, gossiping. *Pers Soc Psychol Bull* 4:161–168
- Foster EK (2004) Research on gossip: taxonomy, methods, and future directions. *Rev Gen Psychol* 8:78–99
- Frith CD, Frith U (2006) How we predict what other people are going to do. *Brain Res* 1079:36–46
- Giardini F, Conte R (2011) Gossip for social control in natural and artificial societies. *Simulation: transactions of the society for modeling and simulation international*. doi:10.1177/003754971140691
- Giardini F, Di Tosto G, Conte R (2008) A model for simulating reputation dynamics in industrial districts. *Simul Model Pract Theory* 16(2):231–241
- Giardini F, Conte R, Paolucci M (forthcoming) Reputation for complex societies. In: In Edmonds B, Meyer R (eds), *Handbook on simulating social complexity*, Springer-Verlag, Heidelberg (ISBN/ISSN: 978-3-540-93812-5)
- Gintis H, Smith EA, Bowles SL (2001) Cooperation and costly signaling. *J Theor Biol* 213:103–119
- Gluckman M (1963) Gossip and scandal. *Curr Anthropol* 4:307–316
- Goodman RF, Ben-Ze'ev A (1994) *Good gossip* Lawrence. University Press of Kansas, KS
- Haley KJ, Fessler DMT (2005) Nobody's watching? Subtle cues affect generosity in an anonymous economic game. *Evol Hum Behav* 26:245–256
- Hamlin JK, Wynn K, Bloom P (2007) Social evaluation by preverbal infants. *Nature* 450:557–560
- Haviland JB (1977) Gossip as competition in Zinacantan. *J Commun* 27:186–191
- Henrich J, Boyd R, Bowles S, Gintis H, Fehr E, Camerer C, McElreath R, Gurven M, Hill K, Barr A, Ensminger J, Tracer D, Marlow F, Patton J, Alvard M, Gil-White F, Smith N (2005) "Economic Man" in cross-cultural perspective: behavioral experiments from 15 small-scale societies. *Behav Brain Sci* 28:795–815
- Hess NH, Hagen EH (2006) Sex differences in indirect aggression: psychological evidence from young adults. *Evol Hum Behav* 27:231–245
- Hess NH, Hagen EH (2009) Informational warfare: coalitional gossiping as a strategy for within-group aggression preprint available online at <http://anthrovancouverwsuedu/faculty/hess/> Accessed 10 December 2010
- Humphrey N (1976) The social function of intellect. In: Bateson PPG, Hinde RA (eds) *Growing points in ethology*. Cambridge University Press, Cambridge, pp 303–317
- Ingram GPD, Piazza JR, Bering JM (2009) The adaptive problem of absent third-party punishment. In: Høgh-Olesen H, Bertelsen P, Tønnesvang J (eds) *Human characteristics: evolutionary perspectives on human mind and kind*. Cambridge Scholars, Newcastle-upon-Tyne, pp 205–229
- Kniffin KM, Wilson DS (2005) Utilities of gossip across organizational levels: multilevel selection, free-riders and teams. *Hum Nat* 16:278–292
- Mascaro O, Sperber D (2009) The moral, epistemic, and mindreading components of children's vigilance towards deception. *Cognition* 112(3):367–380
- Maynard Smith J, Harper DGC (1995) *Animal signals: models and terminology*. J Theor Biol 177:305–311
- Maynard Smith J, Harper D (2003) *Animal signals* Oxford. Oxford University Press, Oxford
- Miceli M, Castelfranchi C (2000) The role of evaluation in cognition and social interaction. In: Dautenhahn K (ed) *Human cognition and agent technology*. Benjamins, Amsterdam
- Milinski M, Semmann D, Krambeck HJ (2002) Reputation helps solve the 'tragedy of the commons'. *Nature* 415:424–426
- Mohtashemi M, Mui L (2003) Evolution of indirect reciprocity by social information: the role of trust and reputation in evolution of altruism. *J Theor Biol* 223:523–531
- Nettle D (2006) Language: costs and benefits of a specialised system for social information transmission. In: Wells JCK, Strickland S, Laland K (eds) *Social information transmission and human biology*. Taylor & Francis, London, pp 137–152
- Noon M, Delbridge R (1993) News from behind my hand: gossip in organizations. *Org Stud* 14:23–36
- Nowak MA (2006) Five rules for the evolution of cooperation. *Science* 314:1560–1563
- Nowak MA, Sigmund K (1998a) Evolution of indirect reciprocity by image scoring. *Nature* 393:573–577
- Nowak MA, Sigmund K (1998b) The dynamics of indirect reciprocity. *J Theor Biol* 194:561–574
- Ohtsuki H, Iwasa Y (2004) How should we define goodness? Reputation dynamics in indirect reciprocity. *J Theor Biol* 231:107–120
- Paine R (1967) What is gossip about? An alternative hypothesis. *Man* 2(2):278–285
- Panchanathan K, Boyd R (2003) A tale of two defectors: the importance of standing for evolution of indirect reciprocity. *J Theor Biol* 224:115–126
- Panchanathan K, Boyd R (2004) Indirect reciprocity can stabilize cooperation without the second-order free rider problem. *Nature* 432:499–502
- Piazza J, Bering JM (2008) Concerns about reputation via gossip promote generous allocations in an economic game. *Evol Hum Behav* 29(3):172–178
- Sabater J, Paolucci M, Conte R (2006) RepAge: reputation and image among limited autonomous partners. *J Artif Soc Soc Simul* vol 9, no 2 <http://jassssoccsurreyacuk/9/2/3html>
- Scott-Phillips TC (2008) On the correct application of animal signalling theory to human communication. In: Smith ADM, Smith K, Ferrer R, Cancho I (eds), *The evolution of language: proceedings of the 7th international conference on the evolution of language*, Singapore: World Scientific, p 275–282
- Smith EA (2010) Communication and collective action: language and the evolution of human cooperation. *Evol Hum Behav* 31:231–245
- Sommerfeld RD, Krambeck H, Milinski M (2007a) Multiple gossip statements and their effects on reputation and trustworthiness. *Proc R Soc B* 275:2529–2536

- Sommerfeld RD, Krambeck H, Semmann D, Milinski M (2007b) Gossip as an alternative for direct observation in games of indirect reciprocity. *Proc Natl Acad Sci USA* 104:17435–17440
- Stewart PJ, Strathern A (2004) Witchcraft, sorcery, rumors, and gossip for, new departures in anthropology series. Cambridge University Press, Cambridge
- Taylor G (1994) Gossip as moral talk. In: Goodman RF, Ben-Ze'ev A (eds) *Good gossip* Lawrence. University Press of Kansas, KS, pp 34–46
- Wedekind C, Milinski M (2000) Cooperation through image scoring in humans. *Science* 288(5467):850–852
- Wellman HM (1990) *The child's theory of mind* Cambridge. MIT Press, MA
- Wert SR, Salovey P (2004) A social comparison account of gossip. *Rev Gen Psychol* 8:122–137
- Zahavi A, Zahavi A (1997) *The handicap principle: a missing piece of Darwin's puzzle*. Oxford University Press, Oxford